New Hampshire Natural Heritage Inventory
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Overview of Natural Communities in New Hampshire

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A Quick Overview of the NH Natural Heritage Inventory's Purpose and Policies

The Natural Heritage Inventory is mandated by the Native Plant Protection Act of 1987 (NH RSA 217-A) to determine protective measures and requirements necessary for the survival of native plant species in the state, to investigate the condition and degree of rarity of plant species, and to distribute information regarding the condition and protection of these species and their habitats.

The Natural Heritage Inventory provides information to facilitate informed land-use decision-making. We are not a regulatory agency; instead, we work with landowners and land managers to help them protect the State's natural heritage and meet their land-use needs.

Inventory involves identifying new occurrences of sensitive species and classifying New Hampshire's biodiversity. We currently study more than 600 plant and animal species and 120 natural communities. Surveys for rarities on private lands are conducted only with landowner permission.

Tracking is the management of occurrence data. Our database currently contains information about more than 4,000 plant, animal, and natural community occurrences in New Hampshire.

Interpretation is the communication of Natural Heritage Inventory information. Our goal is to cooperate with public and private land managers to help them *protect* rare species populations and

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INTRODUCTION

The New Hampshire Forestry Laws (RSA 227) assert that a diverse forest cover is critical to the protection of biologically diverse populations of plants and animals and that "accurate and detailed information concerning the state's forest resources and uses is essential to planning for multiple use and perpetuation of those resources." Recognizing this, the New Hampshire Forest Resources Plan recommends that comprehensive biological inventories be completed on all public lands (objective 7-2; Forest Resources Plan Steering Committee and DRED DFL 1996). To accomplish this objective and better manage state lands for multiple uses, the Division of Forests and Lands (DFL) has initiated a project for the New Hampshire Natural Heritage Inventory (NH Heritage) to survey all lands managed by the Department of Resources and Economic Development (DRED) for rare plants and exemplary natural communities.

Given the need for information concerning New Hampshire's forest resources, it has become critical that such information be gathered both efficiently and from multiple sources. On state lands, foresters gain a detailed view of much of the landscape during their inventory and management work. As foresters become more familiar with the natural communities that NH Heritage ecologists use to describe the state's vegetation, they can make increasingly valuable contributions to the ongoing collection of information regarding rare plants and exemplary natural communities on state lands.

The purpose of this document is to provide an overview of natural communities in New Hampshire that will help foresters and other natural resource specialists recognize broad groups of natural communities that occur in the state. This overview includes: (1) a brief summary of key characteristics of wooded landscapes in the state, including sparse woodlands to forested uplands and wetlands, to provide context for understanding the rarity and significance of natural communities in New Hampshire; and (2) a table summarizing the state's natural communities into broad groups, including a description of each group, examples of component natural communities, and an assessment of rarity.

The companion document to this overview, the *Key to Upland Forest Communities in New Hampshire*, provides a step-by-step way to identify natural communities in upland forest settings, specifically. The guide provides concise characteristics that can be used to distinguish the natural communities within three broad groups of upland forest communities: spruce-fir forests; northern and transition hardwood-conifer forests; and oak, oak-hickory, and oak-pine forests. The *Key to Upland Forest Communities* is tailored specifically to the upland, forested natural communities that foresters most frequently encounter. In contrast, this *Overview of Natural Communities in New Hampshire* provides a general framework for recognizing many groups of communities that may contain rare plant populations or exemplary natural communities, and therefore are of ecological interest.

NH HERITAGE ECOLOGICAL APPROACH

NATURAL COMMUNITIES

NH Heritage classifies the landscape with "natural communities," which are recurring assemblages of species found in particular physical environments. Each natural community type is distinguished by three characteristics: (1) a definite plant species composition; (2) a consistent physical structure (such as forest, shrubland, or grassland); and (3) a specific set of physical conditions (such as different combinations of nutrients, drainage, and climate conditions). Natural communities include both wetland types (e.g., red maple basin swamp) and uplands such as woodlands (e.g., rich red oak-sugar maple/ironwood talus woodland) and forests (e.g., hemlock-beech-oak-pine forest).

Across the landscape, natural communities form a mosaic of patches of different sizes. Some tend to be small (such as forest seeps) while others may cover large areas (such as montane spruce-fir forests). Further, boundaries between natural community types can be either discrete (and therefore easily identified in the field) or gradual (thus making some areas difficult to map). Below we describe how and why natural communities are classified, show how our classification of them compares to other classification systems, and explain the concept of “exemplary” natural communities and their importance to conservation.

NATURAL COMMUNITY CLASSIFICATION

Classifying natural communities enables ecologists, land managers, and others to communicate effectively and to make management decisions regarding ecological systems. Community classification is a powerful tool because it provides a framework for evaluating the ecological significance of pieces of the landscape in both state and regional contexts. Understanding both the rarity of a community within the state and region and the quality of each example is critical to informed conservation planning. As landscape units that share physical and biological characteristics important to many species, natural communities help focus management and conservation attention in an efficient manner, particularly since our knowledge of the individual species in a particular community is often incomplete. In addition, use of a natural community classification can help us understand how ecological processes in one community may affect neighboring communities. For example, knowing that the surrounding upland forest soils are a primary source of nutrients flowing into a poor fen community is important information for land managers to consider when planning management activities.

The classification of natural communities in New Hampshire is based on data from more than 10 years of ecological research by ecologists with NH Heritage and The Nature Conservancy, plus extensive reviews of scientific literature. These data have been compiled and used to define natural community types in part through the application of ordination and classification techniques. Most state natural heritage programs continually update their classifications and cooperate with The Nature Conservancy's regional and national ecologists to ensure that natural community types are comparable across state lines.

The names of natural community types generally begin with the dominant or most characteristic plant species, and may include the name of a landscape feature or vegetative structure that is typical of that community. For example, the community type “black gum-red maple basin swamp” refers to a basin swamp (a specific landscape feature, as opposed to a streamside swamp) with black gum *and* red maple in the canopy. In addition, like all Society of American Foresters (SAF) forest cover types, forested natural communities may have many overlapping species and other characteristics, but they are defined by distinct and diagnostic combinations of species and physical characteristics. For example, the red spruce-northern hardwood natural community has considerably more red spruce in the overstory, and is generally higher in elevation, than the standard northern hardwood forest (sugar maple-beech-yellow birch forest natural community) despite many species that occur in both.

Natural Communities Compared to Other Classification Systems

Many classification schemes are used to define vegetation types or other land units. While many of them have utility for certain purposes, most differ from the natural community classification in terms of their founding principles, attributes, and goals. In the following paragraphs, several of these classification schemes are contrasted with the natural community classification used by NH Heritage.

SAF COVER TYPES

While natural community names can be similar to the names of SAF forest cover types, natural communities are defined using a broader range of considerations. SAF forest cover types are primarily based on dominant tree species, while natural communities are based on all plant species, the structure of these species, and the specific physical environment. Trees are often subtle indicators of their environments. A number of natural communities can be distinguished based largely on trees, and in some cases a difference in tree composition is the main difference between two community types. However, some trees are so broadly adapted that their presence does not precisely indicate site conditions (e.g., white pine or red maple). Differences in tree canopy composition may also primarily relate to cutting or other disturbances.

For example, there are four SAF spruce-fir cover types that correspond to the "montane spruce-fir forest" natural community type. These different cover types primarily relate to stand disturbance history or the successional stage rather than to major environmental differences. The four cover types also do not differentiate between upland spruce-fir forests and spruce-fir swamps. When one considers understory species and soils, upland spruce-fir forests are markedly different from the red spruce/*Sphagnum* basin swamp natural community. In fact, the differences between these two natural communities are more dramatic than the internal differences among the four SAF spruce-fir cover types. SAF cover types are useful, however, for timber management purposes.

NATIONAL VEGETATION CLASSIFICATION SYSTEM

At a national level, The Nature Conservancy has published a National Vegetation Classification System (NVC; Grossman *et al*. 1998; Anderson *et al*. 1998) that uses a formal classification hierarchy emphasizing differences in both vegetation structure and floristic composition. This system is periodically updated to include new information from more specific natural community classifications developed at the state level, such as the New Hampshire natural community classification. The Federal Geographic Data Committee has adopted a vegetation classification standard derived from the NVC for use by federal agencies, and future development of the classification is expected to be a collaborative effort (Grossman *et al*. 1998). Natural communities are synonymous in scale and in concept to the "association" level of the NVC. The primary difference between the two classifications is that the New Hampshire classification uses environmental characteristics directly in the organizational hierarchy (*e.g.*, floodplain forests and talus slopes), whereas the NVC hierarchy is based primarily on vegetation characteristics alone.

USFWS WETLAND CLASSIFICATION

A classification scheme frequently used in wetland and aquatic systems was produced by Cowardin *et al.* (1979) for the U.S. Fish and Wildlife Service (USFWS). In the USFWS system, wetlands and deepwater habitats are defined by their vegetation, substrate, and frequency of flooding in a hierarchy that emphasizes flooding regimes and attributes of vegetation at a coarse scale (e.g., vegetation structure, life-form, persistence, etc.). This classification system is useful because of its applicability to broad geographical regions and because it can be readily applied in conjunction with aerial photograph interpretation. It was the basis for wetland typing in the National Wetland Inventory mapping effort.

Natural community types can typically nest within the hierarchical structure of the USFWS system. In addition to the flooding regimes and coarse vegetation characteristics used to distinguish USFWS types, however, the natural community classification considers factors such as nutrient regime, water source, and geomorphic setting, as indicated by specific differences in floristic composition. For example, under the USFWS system, red maple/*Sphagnum* saturated basin swamps and red maple-black ash/swamp saxifrage seepage swamps would both be considered saturated, palustrine broad-leaved deciduous forested wetlands. This grouping does not reflect important differences between the two communities, including differences in species composition (ground cover by *Sphagnum* versus forb species), nutrient levels (species indicative of nutrient-poor versus minerotrophic conditions), water sources (upland runoff versus groundwater seepage), geomorphic settings (basin depression versus headwater seepage area), and soils (deep peat versus shallow peat over silt). The natural community classification provides additional detail regarding ecological conditions and processes that helps clarify the distribution of biological diversity across the landscape.

ECOLOGICAL LAND TYPES

Defined to date only for national forest lands in New Hampshire, the U.S. Forest Service's Ecological Land Types (ELTs) emphasize particular soil features, including depositional environment, soil texture, and soil depth. Although some ELTs correspond reasonably well to groups of communities, they are not easily compared to natural communities for five primary reasons. First, ELTs in New Hampshire are limited to uplands. Second, they are mapped as units of 100 or more acres, so natural communities that occur as smaller patches are not detected and often occur within many ELT types. Third, ELTs can be related to general tree species composition, but the composition of other plant species is not considered directly. Fourth, ELTs do not directly reflect the mineral composition of soil and bedrock, whereas natural communities do. Finally, ELTs describe some fine-scale soil characteristics that may have silvicultural significance but sometimes have no known corresponding floristic expression.

EXEMPLARY NATURAL COMMUNITIES

NH Heritage places particular emphasis on and gives conservation priority to "exemplary" natural communities. Exemplary natural communities include all examples of rare types (such as a rich mesic forest) and high-quality examples of common types. High-quality natural communities are identified as having relatively little human impact. These areas have greater potential to contain or achieve natural dynamics that are characteristic of the original community types. A forested natural community need not be "old growth" to obtain exemplary status. Typical exemplary forested natural communities have a variety of characteristic species, natural regeneration within forest gaps, multiple age classes, diverse structural characteristics, abundant standing and fallen woody debris, intact soil processes, and little direct evidence of human disturbance. Such characteristics can only be studied, preserved, and understood by having appropriate reference sites. Further, exemplary natural communities represent the best remaining examples of New Hampshire's flora, fauna, and underlying ecological processes.

The effects of natural disturbances, such as the 1998 ice storm, do not preclude any natural community from being designated exemplary. Damages caused by natural disturbances, including ice storms, blowdowns, and fire, are part of the suite of natural processes influencing natural community dynamics. We take disturbance such as heavy ice damage into account when assessing natural communities, but if a community also displays exemplary attributes, including minimal human influence, then we are likely to classify it as such.

RARITY

NH Heritage considers the rarity of a natural community or a species both within New Hampshire and across its total range. We identify the degree of rarity within New Hampshire with a "state rank" and throughout its range with a "global rank." Ranks are on a scale of 1 to 5,

with a 1 indicating critical imperilment, a 3 indicating that the species or natural community is uncommon, and a 5 indicating that the species or natural community is common and demonstrably secure (see Appendix 1 for more details). Species and natural communities considered to be globally rare or state rare are those designated G1-G3 or S1-S3, respectively. Some species are rare both globally and in New Hampshire (e.g., G2 S1), while others are common elsewhere but rare in New Hampshire (e.g., G5 S1). Many communities have not been assigned global ranks at this time, pending a comprehensive review of their status and distribution range-wide.

QUALITY RANKS

In addition to considering the rarity of a natural community or species as a whole, NH Heritage ranks the quality of individual natural community occurrences and rare plant populations. These "Quality Ranks" give a more detailed picture of significance and conservation value. Quality ranks are based on the *size*, *condition*, and *landscape context* of a natural community or rare species population. These terms collectively refer to the integrity of natural processes or the degree of human disturbances that may sustain or threaten long-term survival. There are four quality ranks:

Rank	Description
A	**Excellent Occurrence:** An A-ranked natural community is a large example nearly undisturbed by humans or which has nearly recovered from early human disturbance and will continue to remain viable if protected. An A-ranked rare species occurrence is large in both area and number of individuals, is stable, exhibits good reproduction, exists in a natural habitat, and is not subject to unmanageable threats.
B	**Good Occurrence:** A B-ranked community is still recovering from early disturbance or recent light disturbance by humans and/or may be too small in size to be an A-ranked occurrence. A B-ranked population of a rare species occurrence is at least stable, grows in a minimally human-disturbed habitat, and is of moderate size and number.
C	**Fair Occurrence:** A C-ranked natural community is in an early stage of recovery from disturbance by humans and/or a small sized representative of the particular type of community. A C-ranked population of a rare species is in a clearly human-disturbed habitat and/or small in size and/or number, and possibly declining.
D	**Poor Occurrence:** A D-ranked natural community is severely disturbed by humans, its structure and composition are greatly altered, and recovery is unlikely. A D-ranked occurrence of a rare species is very small, has a high likelihood of dying out or being destroyed, and exists in a highly human-disturbed and vulnerable habitat.

For example, consider a population of a rare orchid growing in a bog that has a highway running along one border. The population may be large and apparently healthy (large *size* and intact *condition*), but the long-term threats posed by disturbance at the bog's edge – its low-quality

landscape context (pollution from cars and roads, road-fill, garbage, altered hydrology, reduced seed dispersal, etc.) – may reduce the population's long-term viability. Such a population of orchids would receive a lower rank than a population of equal *size* and *condition* in a bog completely surrounded by a forest (i.e., with a higher quality *landscape context*).

NH Heritage, in collaboration with other state heritage programs and The Nature Conservancy, is working to develop quality rank specifications for all of New Hampshire's natural communities and rare plant species. Unfortunately, limited time and incomplete knowledge, both on local and global scales, have prevented the development of thoroughly tested and peer reviewed quality rank specifications for most of New Hampshire's natural communities and rare species.

In the absence of rank specifications for each natural community, NH Heritage uses broad guidelines for assigning preliminary quality ranks. The guidelines for assessing the size, condition, and landscape context for natural communities are described below.

SIZE

Occurrence size is a quantitative measure of area occupied by a species or natural community and accounts for such factors as population abundance, fluctuation, density, and area of occupancy for species. All else being equal, the larger a natural community is, the more viable it will be. Large size is correlated with increased heterogeneity of internal environmental conditions, integrity of ecological processes, species richness and size of constituent species populations and their respective viability, potential resistance to change, resilience against perturbations, and ability to absorb disturbances. Size is used in a relative sense with respect to the range of sizes exhibited by the particular natural community type.

CONDITION

Condition is a combined measure of the quality of reproduction (for species), development/maturity (for communities), degree of integrity of ecological processes, species composition, biological and physical structure, and abiotic physical factors within the occurrence. For example, old growth forests with little anthropogenic disturbance and intact biotic and abiotic factors, structures, and processes, would warrant an "A" rank for condition regardless of size.

1. **Excellent Condition:** Old growth or minimally disturbed by human impacts with recovery essentially complete, or in the case of disturbance-maintained communities (e.g., pitch pine/scrub oak barrens), the natural disturbance regime has prevailed continuously with no significant or irreversible alterations by humans; ecological processes, species composition, and structural features are intact.

2. **Good Condition:** Mature examples with only minor human impacts or good potential for recovery from relatively minor past human impacts; ecological processes, species composition, and structural features are largely intact.
3. **Fair Condition:** Immature examples or those with significant human impacts with questionable recovery potential or in need of significant management and/or time to recover from present condition; ecological processes, species composition, and structural features have been altered considerably but not to the extent that the occurrence is no longer viable if managed and protected appropriately.
4. **Poor Condition:** Little long term viability potential.

LANDSCAPE CONTEXT

Landscape context is a combined measure of (a) the quality of landscape structure, (b) the extent (including genetic connectivity), and (c) the condition of the surrounding landscape that influences the occurrence's condition and viability. Dynamic natural community occurrences have a better long-term viability when they are associated with large areas of diverse habitat that support dynamic ecosystem processes. Potential factors to be considered include: (a) the degree of landscape fragmentation; (b) the relationship of a natural community to contiguous wetland or upland natural communities; (c) the influence of the surrounding landscape on susceptibility to disturbance; (d) the relative position in a watershed; (e) susceptibility of the occurrence to pollutants and hydrologic change (Chase *et al*. 1995); and (f) the functional relationship of the natural community to surrounding natural landscape features and larger-scale biotic and abiotic factors. For example, open peatlands are extremely sensitive to nutrient input, basin swamps are moderately sensitive, and streamside/riverside communities and seepage swamps are less sensitive.

In general, landscape condition is weighted towards the immediate 30-300 m (100-1000') buffer area around the natural community where direct impacts of land use may be most significant. The adjacent 1.6-3.2 km^2 (1-2 mi^2) area or relevant watershed area around the natural community is considered to a lesser degree. In turn, the larger area beyond the relevant watershed receives the least consideration. The actual size applied for a natural community varies according to the characteristics of the particular natural community and the specific context of the occurrence in the landscape.

1. **Excellent Landscape Context:** Natural community is embedded in a matrix of undisturbed, unfragmented surrounding natural communities that have functional connectivity to the occurrence; past human disturbances that potentially influence the community are minimal or negligible.
2. **Good Landscape Context:** Surrounding landscape is largely intact and minimally fragmented, or human disturbance/fragmentation is of a configuration and magnitude that is

consistent with maintaining the current condition of the occurrence, or disturbances can be managed to achieve viability.

3 **Fair Landscape Context:** Significant human impacts, development, fragmentation, and other disturbances characterize the landscape around the natural community and may affect the long term viability and condition of the occurrence.

4. **Poor Landscape Context:** Functional human impacts, fragmentation and loss of natural communities dominate the surrounding landscape; the occurrence is probably not viable, even with management.

PROTECTING NEW HAMPSHIRE'S BIODIVERSITY

In 1994, the Northern Forest Lands Council (1994) concluded that "maintaining the region's biodiversity is important in and of itself, but also as a component of stable forest-related economies, forest health, land stewardship, and public understanding." In response to recommendations by the Northern Forest Lands Council, the NH Division of Forests and Lands and the NH Fish and Game Department established the Ecological Reserves System Project. One of the project's primary objectives was to "assess the status of biodiversity in New Hampshire and the extent to which it is protected under the current system of public and private conservation lands" (NH Ecological Reserve System Project 1998a). This question was then explored by a 28-member Scientific Advisory Group, who took the question beyond the northern forest and considered it in a statewide context. The conclusions of the group indicated that there was a serious need for continued biodiversity conservation in New Hampshire (NH Ecological Reserve System Project 1998b):

> Though conservation lands comprise approximately 20% of the land area in New Hampshire, the current system of conservation lands in New Hampshire does not appear to provide comprehensive, long-term protection of biodiversity at the species, natural community, or landscape levels.

NH Heritage strives to facilitate protection of the state's biodiversity through the protection of key areas that support rare species, rare types of natural communities, and high quality examples of common natural community types. Exemplary natural communities are particularly important because we assume that, if we protect an adequate number of viable examples of each natural community type, we can protect the majority of New Hampshire's species. This is sometimes referred to as a "coarse-filter" approach to protecting biodiversity.

The coarse filter can miss important species, however, so it needs to be augmented with a finer filter. The "fine-filter" approach generally focuses on specific rare species. For example, the rare, federally threatened *Isotria medeoloides* (small whorled pogonia) occurs in a variety of second-growth hardwood forests in southern New Hampshire. This orchid's habitat may not be captured by the coarse-filter approach, so we need to employ a fine-filter approach (i.e., survey for the plant itself) to ensure that the species is protected.

Long-term protection of New Hampshire's species, natural communities, and ecological processes requires a variety of conservation approaches. The goal of NH Heritage's coarse- and fine-filter approaches is to inform management decisions by identifying those sites that have a relatively greater potential for maintaining the natural diversity within the state.

The foundation for successful biodiversity protection is a series of representative, high-quality examples of all the state's natural community types, with their constituent species and their underlying ecological processes. The best option for this kind of protection would be a series of connected, high-quality natural community types; this series would ensure that ecological processes that connect natural communities remain functionally intact within a broader landscape context. In short, there is a need for reserve areas with natural communities protected within a diverse landscape, not just in isolation.

OVERVIEW OF NATURAL COMMUNITIES IN NEW HAMPSHIRE

Recognizing broad groups of natural communities and understanding their rarity in relation to other such groups can be an initial step in learning to distinguish natural communities from one another. To provide context for understanding the rarity and significance of forested natural communities in New Hampshire, Figure 1 summarizes key characteristics of wooded landscapes (including both uplands and wetlands) in the state. This brief summary of each group of communities emphasizes factors that characterize each group and describes (in general terms) the rarity status of each group's component communities.

To provide additional detail and to extend this summary to other types of communities in New Hampshire, Table 1 classifies a full range of forested and open natural communities into broad, easily recognizable groups, such as floodplain forests or peatlands. Groups of communities are organized first by system (upland, freshwater wetland, tidal/subtidal, lake/pond, and river/stream), and within each system, by physical structure (e.g., forested, woodland, or open). For each group of communities within each system and structure designation, Table 1 contains a description of the group, examples of natural communities within the group, and an assessment of the rarity of these component communities. Natural community types follow Sperduto (2000a, b). See Appendix 1 for an explanation of the global and state rank codes that summarize rarity status.

Figure 1. Key characteristics of wooded landscapes in New Hampshire.

Acidic Upland Forests: Acidic upland forests are common on New Hampshire's predominantly acidic, nutrient-poor soils. Acidic forests tend to be distinguished from enriched forests by the abundance of pine, spruce, hemlock, oak, or beech, which are generally less frequent in enriched settings. The concentration of rare plants and exemplary natural communities in these matrix forests is generally low, although acidic upland forests with trees greater than 150 years in age may be of interest as exemplary, old forests. Also of interest are forests with abundant white oak, scarlet oak, black oak, hickory, or other southern/Appalachian species; these communities are restricted to southern New Hampshire and contain many rare southern species that are at their northern range limits.

Enriched Upland Forests: Enriched forests are uncommon to rare in New Hampshire. They occur in dry to mesic settings, particularly in areas of calcium-rich bedrock and at the bases of steep slopes, where organic materials and sediments may accumulate and contribute to enrichment. While enriched forests are most frequent within approximately 30 miles of the Connecticut River, they occur in localized patches throughout the state. Enriched forests are generally dominated by tree species such as sugar maple, white ash, and basswood. Herbs that indicate strong enrichment include blue cohosh, maidenhair fern, and Dutchman's breeches; species indicative of moderate enrichment include baneberry, wood nettle, jack-in-the-pulpit, Christmas fern, alternate-leaved dogwood, red-berried elder, and ironwood (hop-hornbeam). Enriched forests also occur in the oak-hickory region of New Hampshire, which may have an abundance of southern/Appalachian species such as dogwoods or leatherwood.

Talus Slopes: Talus slopes are areas of coarse rock debris accumulated at the bases of cliffs, and their vegetation ranges from closed-canopy forests to open barrens, depending on talus size, degree of soil development, and level of disturbance. Acidic and enriched talus forest/woodlands and barrens are generally rare or uncommon in New Hampshire. Talus forest/woodlands can be distinguished from those on stable substrates by herb, shrub, and vine species characteristic of woodland openings, rocky areas, or disturbed habitats, such as gooseberries and currants, climbing buckwheat, poison ivy, Virginia creeper, and rock polypody.

Rocky Ridges: Rocky ridge communities are open rock outcrop areas typically interspersed with scattered patches of trees and heath shrubs such as low bush blueberry or huckleberry. They occur on dry, exposed summits, ridges, and other hillside bedrock outcrops with thin soils. Most types are rare in New Hampshire. Rocky ridge communities can often be identified by a combination of the landscape setting, vegetation structure, and dominant tree species, which may include jack pine, red pine, red spruce, or oak.

Sand Plain Systems: Sand plains are generally flat, pine-dominated systems often embedded with uncommon wetland types such as bogs or fens. Pitch pine, red pine, or white pine may be abundant in varying proportions. Forest/woodlands dominated by pitch or red pine are rare in New Hampshire.

Floodplain Forests: Floodplain forests occur on temporarily flooded silt, loam, and sand terraces adjacent to major and minor rivers and major streams. Most floodplain forest types are rare or uncommon in New Hampshire. Low floodplain forests associated with major rivers are typically dominated by silver or sugar maple. Floodplain and higher terrace forests along minor rivers and major streams are frequently dominated by red maple; additional dominant or codominant tree species may include swamp white oak, balsam fir, or sycamore.

Forested Swamps: Forested swamps typically occur in basin settings, seepage areas, or adjacent to rivers, streams, or lakes. Water levels are at or near the ground surface for part to much of the year. Forested swamps dominated primarily by red maple are fairly widespread in New Hampshire; rare or uncommon swamps are those with a high abundance of species such as black gum, black spruce, Atlantic white cedar, northern white cedar, black ash, or swamp white oak. Seepage conditions in forested swamps, which often support rare plants, may be indicated by species such as northern white cedar, black ash, spicebush, sensitive fern, and many wetland orchids.

Forest Seeps: Forest seeps are similar to larger swamps or marshes but occur as small wetland inclusions within upland forests. Groundwater is discharged at or near the soil surface, either continuously or for much of the year. Most seeps are on slopes from 1-25 degrees and are less than 0.1 acre. Functionally, seeps serve as refugia for wetland plants, amphibians, and other organisms in upland-dominated landscapes. Acidic seeps are relatively common in New Hampshire, but circumneutral or enriched seeps are uncommon or rare. Some species diagnostic of seepage include jewelweed, small enchanter's nightshade, dwarf raspberry, and golden saxifrage.

UPLANDS (TERRESTRIAL SYSTEM):
FORESTS (>60% tree cover)

Windthrow (falling trees) and herbivory are the primary natural disturbances; high-elevation spruce-fir forests are subject to larger blowdown areas than are hardwood forests. Fire and insects affect forests but over much smaller areas than in boreal forests north of NH.

Natural Community Group	Characteristics and Landscapes	Examples and Other Comments
Spruce-fir forests	Typically at elevations of 2500-4890 ft.; also occur at lower elevations on shallow or poorly drained soils, in other settings influenced by cold-air drainage, or on deep, coarse valley bottom sediments. Prominent woody species in montane areas include red spruce, balsam fir, paper birch, heartleaf birch, yellow birch, big-toothed aspen, mountain maple, and striped maple. White spruce occurs in the state only north of the White Mountains.	Uncommon to rare. Five types documented in NH: • High-elevation montane spruce-fir forest (S4; mostly >2500 ft.) • High-elevation balsam fir forest (S3S4; mostly 3500-4500 ft.) • Montane black spruce-red spruce forest (S1; 2500-3000 ft., perhaps lower in northern Coos County) • Lowland spruce-fir forest (S1S2?; <2500 ft.) • Red pine-white pine-balsam fir forest (S3?; cold-air drainage settings; central NH and north)
Northern and transition hardwood-conifer forests	Typically on acidic, nutrient-poor soils of till, river terrace, and outwash origin. Local pockets of enriched forests are typically influenced by calcium-rich bedrock or till or topographic positions where organic materials and sediments may accumulate and contribute to enrichment. Northern hardwood-conifer forests generally at elevations of 1000-2500 ft.; dominated by varying mixtures of sugar maple, beech, and yellow birch, with a red spruce-balsam fir component at higher elevations. Transition hardwood-conifer forests throughout central/southern NH and below 1500 ft.; red oak, white pine, and hemlock more prevalent.	Seven acidic forest types and two enriched types documented in NH: • Acidic types generally common and widespread. Matrix northern hardwood forest is sugar maple-beech-yellow birch forest (S5); matrix transition forest is hemlock-beech-oak-pine forest (S5). • Rich and semi-rich types uncommon/local because of restriction to enriched soils. Canopy typically dominated by sugar maple and often by significant white ash and/or basswood; beech only occurs in semi-rich examples.

Natural Community Group	Characteristics and Landscapes	Examples and Other Comments
Oak, oak-hickory, and oak-pine forests	Forests in central and southern New Hampshire of low to moderate elevations on dry to mesic soils of ridges/slopes on glacial till, river terraces, and sand plain features (e.g., outwash, eskers, etc.). Often dominated by various combinations of oak, hickory, and pine species. Often referred to as "central hardwood" or "Appalachian oak" forests because many species have distributions that are centered further south in the Appalachian region (e.g., black oak, scarlet oak, hickory species, sassafras, and mountain laurel). Acidic types often have a prominent heath shrub layer; enriched types lack heath shrubs and have species indicative of fertile soils, such as ash, basswood, and maidenhair fern.	Nine types documented in the state. Most are considered imperiled in NH or rare with a restricted range. Prominent groups of communities: • Dry acidic oak-hickory-pine types, including pitch pine communities • Mesic and dry-mesic acidic Appalachian oak-hardwood-conifer forests • Enriched Appalachian oak-hickory-hardwood forests
Talus forest/ woodlands (25-60% tree cover)	Talus consists of coarse rock debris accumulated at the bases of cliffs. Some talus slopes have stabilized because the cliff that produced the talus has completely disintegrated or stabilized; other talus slopes are highly unstable and boulders continue to erode from the cliff above. Talus slopes range from closed canopy forests to open barrens, depending on talus size, degree of soil development, and level of disturbance. Distinguished from forests on stable substrates by herb, shrub, and vine species characteristic of woodland openings and/or disturbed habitats. Northern examples are characterized by red spruce, balsam fir, and other northern species; southern examples are characterized by red oak and black birch on acidic soils and by red oak, sugar maple, and ironwood (*Ostrya virginiana*) on richer soils. Hickory may also be present in southern NH, generally below 500 ft.	Five types documented in NH. Most are rare or relatively uncommon. Types fall into three groups: • Acidic subalpine/montane types, such as the spruce-birch/mountain maple talus forest/woodland community (S3) • Acidic transitional/Appalachian types, such as the red oak-hickory-black birch/marginal woodfern talus forest/woodland (S1S2) • Enriched types, such as the rich red oak-sugar maple/ironwood talus forest/woodland (S2S3)
Forests on dunes	Densely wooded forests or woodland shrub thickets in protected hollows of dune systems. Canopy dominated by black cherry, shadbush (*Amelanchier stolonifera*), quaking aspen, red maple, and occasionally pitch pine.	Single community, maritime dune forest/woodland (S1), documented from one site in NH.

UPLANDS (TERRESTRIAL SYSTEM):

WOODLANDS (25-60% tree cover) AND BARRENS (<25% tree cover)

Woodlands and "barrens" communities form where natural disturbances and other conditions prevent or limit the establishment and success of trees. Such disturbances and conditions include fire, bedrock exposures with little soil development, unstable talus slopes, and extreme climate of alpine areas.

Natural Community Group	Characteristics and Landscapes	Examples and Other Comments
Talus woodland/ barrens	Communities occur on talus slopes. Patchy tree canopy may be interspersed with openings that have been disturbed by rock fall, rock movement, avalanches, or windthrow. See section on talus forest/woodlands for additional detail.	Two specific types documented in NH, but talus woodland/barrens may also be components of the talus forest/woodland communities described above. Examples: • Subalpine cold-air talus woodland/barren (G3 S1) • Temperate lichen talus/barren (S1S2?)
Rocky ridges	Dry, exposed summits, ridges, and other hillside bedrock outcrops with limited soil development. Often influenced by fire and/or human disturbance. Open rock outcrop areas are typically interspersed among scattered patches of trees and heath shrubs. Some summits are true "barrens" with few trees due to continued or severe disturbance. Elevation is important in determining plant communities. High elevation examples transition to alpine and subalpine vegetation.	Eight types documented in NH, including two rich/semi-rich types. Most are rare. Examples of rocky ridge communities: • Red spruce/heath/cinquefoil rocky ridge (S3S4) • Jack pine rocky ridge woodland (S1) • Red pine forest/woodland (S2) • Red oak-pine/heath rocky ridge woodland (S2S3)
Cliffs	Very steep, vertical or overhanging outcrops. Many plants require or thrive in cliff environments. Many of NH's cliffs face a southerly direction,as glaciers tended to "pluck" rocks from the south sides of hills. East- or west-facing cliffs were often produced as glaciers scoured notches from north to south. North- facing cliffs are much less common.	Three broad types of cliff occur in each of the major vegetation zones in NH (alpine/boreal; transition; Appalachian/southern): • Acidic cliffs (very common) • Circumneutral or intermediate cliffs (rare) • Calcareous cliffs (very rare; nearly restricted to within 30 miles of Connecticut River in NH)
Alpine communities	Low annual temperatures, short growing season, and high winds limit vegetation to stunted trees, hardy plants of some lowland habitats, and alpine shrubs, herbs, lichens, and mosses. Numerous plant communities correspond to habitats with snow longevity, wind exposure, and particular soil characteristics and disturbance factors.	Alpine communities generally uncommon because of restricted distribution. Examples: • Diapensia-azalea-rosebay dwarf shrubland (S1) • Sedge-rush-heath meadow (S1) • Labrador tea heath/krummholz (S2) • Montane heath woodland (S1S2)

FRESH WATER WETLANDS (PALUSTRINE SYSTEM):
FORESTED WETLANDS (>60% tree cover)

Influenced by geomorphic landform setting, hydrologic regime, substrate type, water chemistry, and water source. Major hydrologic types relate to the relative influence of surface flow, groundwater discharge, and drainage overflow. Regionally, red maple is the most dominant tree species in forested wetlands.

Natural Community Group	Characteristics and Landscapes	Examples and Other Comments
Saturated/seasonally flooded basin swamps	Basin swamps are essentially "forested bogs"; they occur in topographic depressions with limited drainage and are typically nutrient poor. They occur on shallow to deep peat deposits (1) as stagnant, "perched" basins with only surface water flow and no connection to groundwater, and (2) in perched or valley basins connected to and influenced by both groundwater and surface water flow (thus somewhat less stagnant). Found in upland till, bedrock and stratified drift (sand plain) landscapes (*e.g.*, kettleholes) and other valley sediment landscapes. Types of basin swamps can often be distinguished from one another by the dominant tree species, which are strongly influenced by the prevailing climate conditions. Cinnamon fern is common, but sensitive fern is usually absent. Water levels fluctuate, although not as dramatically as in wetlands along streams, and are often at or near the surface for much of the year	Six types documented in NH. Only the red maple/Sphagnum saturated basin swamp community is widespread. Other types: • Atlantic white cedar-yellow birch/sweet pepperbush swamp (S2) • Boreal Atlantic white cedar swamp (S1) • Black spruce-larch/heath/Sphagnum basin swamp (G5S3) • Black gum-red maple basin swamp (S1S2) • Swamp white oak basin swamp (S1)
Seepage and mixed-hydrology swamps	Groundwater influence is prominent in seepage and mixed-hydrology swamps, and usually contributes more nutrients and oxygen. These swamps occur in sloping to nearly level headwater drainage areas and where ground or soil water is forced to the surface by hydrologic pressure or an impervious soil layer. Includes sloping seepage forests in till, outwash, and river terrace sediments, and swamps in basins or catchments with groundwater influence. Diagnostic species of seepage or mixed hydrology conditions include northern white cedar, black ash, spicebush, sensitive fern, and many wetland orchids. Numerous rare plants occur in these wetlands. Water levels may fluctuate less than in seasonally flooded swamps if influenced by a reliable source of groundwater.	Ten types documented in NH, with pH ranging from acidic to intermediate/circumneutral. All are rare or uncommon. Examples: • Red maple-black ash/swamp saxifrage seepage swamp (S2) • Northern hardwood-black ash-conifer seepage swamp (S2) • Northern white cedar-balsam fir seepage swamp (G4 S2) • Northern white cedar-hemlock-red maple swamp (G4 S2)

Natural Community Group	Characteristics and Landscapes	Examples and Other Comments
Seasonally flooded to seasonally saturated swamps	Swamps periodically flooded by a combination of surface water from uplands, overbank flow from streams or minor rivers, and/or overflow from fluctuating lake levels or wind-push in large lakes. May or may not be influenced by groundwater. Water levels fluctuate more widely in these swamps than in basin or seepage swamps.	Four types documented in NH: • Seasonally flooded Atlantic white cedar swamp (S2) • Seasonally flooded red maple swamp (S4S5) • Seasonally saturated red maple swamp (S3S4) • Seasonally flooded boreal swamp (SU)
Forest seeps	Forest seeps are similar to larger swamps or marshes but occur as small wetland inclusions within upland forests. Groundwater is discharged at or near the soil surface, either continuously or for much of the year. Functionally, seeps serve as refugia for wetland plants, amphibians, and other organisms in upland-dominated landscapes. They are located in headwater positions of streams, along "seepage runs" of small drainages, on benches and sloping terrain of upland till hillsides, along upland margins of swamps, and on steep faces of river terraces. Most are on slopes from 1-25 degrees and have mineral soil or a shallow muck horizon at the surface. Generally less than 0.1 acre and often isolated from larger wetlands. Collectively diverse, and variable in composition among examples. Some species diagnostic of seepage: black ash, jewelweed, small enchanter's nightshade, dwarf raspberry (*Rubus pubescens*), and golden saxifrage.	Three broad types documented in NH. Seeps in NH are abundant, but each example is small in size. Acidic seeps are relatively common; circumneutral or enriched seeps are uncommon or rare.: • Acidic Sphagnum seep. Most frequent in spruce-fir forests at higher elevations, but also in other nutrient-poor, coniferous settings. • Subneutral forest seep. Broadly defined group typically in northern hardwood and semi-rich mesic forests. • Circumneutral hardwood forest seep. Small, wet or "super-mesic" enriched hardwood forests that occur as small orbicular seeps, as linear "seepage runs" in a forest, or along river terrace slopes.
Vernal pools	Small, temporarily flooded basins within forests. Occur in till uplands, valleys, floodplains, outwash deposits, and lakebed deposits. Larger, open marshy examples are also called basin marshes. Important feeding and breeding grounds for amphibians, reptiles, and invertebrates.	Uncommon, but occur throughout the state. Two types: • Vernal woodland pool (S3) • Vernal floodplain pool (S2)
FLOODPLAIN FORESTS	Temporarily flooded silt, loam, and sand terraces of major and minor rivers and major streams. Various flood frequencies and length of inundation create complex mosaics of communities.	
Floodplain forests along major rivers	Low floodplain forests associated with NH's major (fourth-order and higher) rivers, typically dominated by silver maple and/or sugar maple.	Four types documented, all very rare. Examples: • Silver maple/wood nettle-ostrich fern floodplain forest (S2) • Sugar maple-silver maple-white ash floodplain forest (S1S2)
Floodplain forests along minor rivers	Floodplain and terrace forests along minor (generally third- and some fourth-order) rivers, frequently dominated by red maple. Additional dominant or co-dominant tree species may include swamp white oak, balsam fir, sycamore, or others.	Seven types documented, most very rare or locally distributed. Examples: • Swamp white oak floodplain forest (S1) • Basswood-white ash-black maple floodplain forest (S1) • Red maple floodplain forest (S2S3) • Balsam fir floodplain forest (S2) • Sycamore floodplain forest (S1)

FRESH WATER WETLANDS (PALUSTRINE SYSTEM):

OPEN WETLANDS (<25% tree cover)

OPEN RIPARIAN SETTINGS WITH MINERAL SOILS

Community variation relates to relative height above river, distance from river, and length of time since the river last flooded or shifted its channel. Open riparian vegetation includes herbaceous wetlands, shrublands, sparse woodlands, and mixed communities that may form mosaics with forested floodplains.

Natural Community Group	Characteristics and Landscapes	Examples and Other Comments
Riparian aquatic beds	Occur in semi-permanently to permanently flooded, relatively shallow zones in shallow water margins of perennial rivers and streams; characterized by submersed and floating-leaved, rooted aquatic vegetation. Connected to a more extensive aquatic riparian system that lacks rooted vegetation and is characterized primarily by animals and non-vascular plants.	Three types documented in NH. Rarity is poorly understood, as communities have not been thoroughly studied. Types: • Riverweed river rapid (S2S3) • Upper perennial aquatic bed (SU) • Lower perennial aquatic bed (SU)
Emergent marshes (shallow to deep)	Temporarily to permanently flooded areas on silt and fine- to medium-grained sand on stream and river shores. Shallow emergent marshes are at the highest elevations in the river channel and remain flooded for the shortest periods each year. Infrequently exposed zones at lower elevations in the river channel may support a deep emergent marsh/aquatic bed community, dominated by floating-leaved, submersed, and emergent herbaceous species such as variegated yellow pond-lily, pondweeds, and pickerel-weed.	Three types documented in NH. Fairly common. Types: • Shallow emergent riparian marsh: river channel cattail marsh (SU) • Medium-depth emergent riparian marsh: aerenchymatous herbaceous river channel (S3S4) • Deep emergent marsh/aquatic bed (S4S5)
River channels (high- and moderate-energy)	Sand/gravel bars and river channels are dynamic and shift in location over time. They include high-energy channel bars with sand, gravel, and cobble substrates; and moderate-energy bars with sand substrates. May be unvegetated, or vegetation is characterized by sparse herb and shrub cover as a result of annual flooding and/or ice scour. (Low-energy river channels include emergent marshes and aquatic beds described above).	Six types documented in NH, ranging from globally rare to relatively common. Examples: • High-energy channel: Hudsonia-silverling river channel (G2 S1), dwarf cherry river channel (S2) • Medium-energy channel: hydric sandy river channel (S3S4), mesic to dry sandy river channel (S4)

Natural Community Group	Characteristics and Landscapes	Examples and Other Comments
Riverbanks and open floodplains	Consolidated riverbanks and open floodplains, exposed to annual flood and ice scour. Vegetation is highly variable, likely depending on factors such as energy level, hydroperiod, and substrate. Includes herb-dominated, shrub-dominated, and sparse woodland communities.	14 types documented in NH, ranging from rare to fairly common. Examples: • Willow low riverbank (S3) • Big bluestem-forb/shrub/sparse woodland riverbank/floodplain (S3S4) • Riverbank/floodplain fern glade (SU)
Riverbank outcrops	Includes open, flood-scoured bedrock exposures along medium-sized and large rivers, typically along river narrows. No emergent seepage, although outcrops may occur with seep communities. Typically sparse vegetation consists of diverse herbs, including flood-tolerant species.	Two types documented in NH: • Acidic riverbank outcrop (S3?) • Circumneutral riverbank outcrop (S1)
Riverbluff openings	Eroding river bluffs resulting from undercutting action of rivers. Range from sparsely vegetated open sands to a woodland structure depending on past disturbance. Various soils. Sand river bluffs along lower Merrimack River have unique plant species.	Two types documented in NH (rarity uncertain): • Dry river bluff (G2G4? S2?) • Mesic river bluff (SU)
Perennial and intermittent streambanks	Streambanks with vegetation and substrate dependent on flow, stream energy level, elevation, and region within the state. Soils may include silt, sand, gravel, cobble, boulder, bedrock, or a turfy mineral substrate.	Nine types documented in NH. Other than alpine/subalpine types, all are widespread. Examples: • Lowland/southern high- to moderate-energy streambank (S4) • Montane/northern low- to moderate-energy intermittent streambank (S4)
Riverbank seeps	Outcrops and turfy sand or gravel with groundwater seepage. Plants similar to those of fens but adapted to flooding and ice scour. Numerous rare plants in Connecticut River calcareous seeps (high pH).	Two types documented in NH. Both are rare. Types: • Acidic/subneutral riverbank seep (G3G4? S2?) • Circumneutral/calcareous riverbank seep (S1)
Oxbow channels	Marsh and shrub swamp communities associated with oxbow river channels.	Three types documented in NH. All are rare or locally distributed. Types: • Oxbow marsh (S3) • Oxbow buttonbush swamp (S3)

FRESH WATER WETLANDS (PALUSTRINE SYSTEM):

OPEN WETLANDS (<25% tree cover)

LAKE, POND, OR SAND DUNE SETTINGS

Communities include herbaceous wetlands, shrublands, and mixed communities on mineral or mucky soils and with temporary to permanent flooding.

Natural Community Group	Characteristics and Landscapes	Examples and Other Comments
MINERAL SOILS OR SHALLOW MUCK OVER MINERAL SOILS	Landscapes include porous substrates of sandy pond shores, sand plains, and dune systems. Geomorphology, vegetation, and hydrology are distinct from typical stream- or lakeside wetlands.	
Sandy pond shores	Pond shore wetlands with broadly fluctuating water levels on wave- and ice-scoured sandy shorelines. Communities occur in bands or zones from the permanently flooded/intermittently exposed area at the immediate pond margin to the temporarily flooded zone at the upland edge. In lower zones, wave and ice disturbance can be severe. Several characteristic rare plant species and many species restricted to the Atlantic coastal plain.	Four types documented in NH, ranging from uncommon to very rare. Examples (from pond edge to upland margin): • Submerged aquatic/rosette stress tolerant sandy pond shore (S1S2) • Twig-rush sandy turf pond shore (S1) • Sweet gale-speckled alder-steeple bush medium-tall shrub thicket (S3)
Closed sand plain basin marshes	Hydrology dominated by precipitation, evapotranspiration, groundwater fluctuations, and limited runoff inputs. Broadly fluctuating ground or surface water levels from spring inundation to nearly dry late summer draw-down. Feeding and breeding grounds for amphibians & reptiles. Several characteristic rare plant species.	Seven types documented in NH. Two shrub types are fairly common; other sand plain basin marshes are very rare. Examples: • Meadow beauty sand plain marsh (S1) • Sharp-flowered manna-grass shallow peat marsh (S1)
Interdunal marsh	Freshwater wetland community in sandy depressions between sand dunes. Dominants vary from swale to swale and include two types: a large cranberry (*Vaccinium macrocarpon*) type and a rush (*Juncus balticus*) type.	Single type documented from a small dune system in Seabrook, NH: coastal interdunal marsh/swale (S1)
MUCKY SOILS	Lake/pond communities are like similarly named groups in riparian settings, but substrate is mucky rather than mineral soil, and hydroperiod (frequency, duration, and timing of flooding) may vary.	
Aquatic beds	Includes quiet shallow-water communities of ponds and lakes. Dominated by floating-leaved, submersed, and emergent herbaceous species such as variegated yellow pond-lily, pondweeds, and pickerel-weed. Generally flooded throughout the year.	Single broadly defined type in need of further classification work: yellow pond lily-pickerel weed-pondweed aquatic bed (S4S5). Common throughout NH.

Natural Community Group	Characteristics and Landscapes	Examples and Other Comments
Emergent marshes (shallow to deep)	Temporarily to permanently flooded. Shallow emergent marshes are usually flooded by one to several feet during spring high water but may be exposed by late summer, while deep emergent marshes may be flooded throughout the year. Vegetation ranges from grasses and sedges (at times mixed with forbs and medium-height shrubs) in shallow emergent marshes to a mixture of emergent species (such as pickerel-weed) and floating-leaved and floating-stemmed aquatics (such as variegated yellow pond-lily) in deep emergent marshes.	Eight types documented in NH. Most are common throughout the state. Examples: • Shallow emergent marsh: tall graminoid emergent marsh (S4), mixed tall graminoid/medium to tall shrub marsh (S4S5) • Medium-depth emergent marsh: open-basin cattail marsh (S4?), undifferentiated tall graminoid medium-depth emergent marsh (S4) • Deep emergent marsh: aerenchymatous/aquatic deep emergent marsh (S4)
Tall shrub thickets	Temporarily to permanently flooded. Found in association with and independently of nearly all other wetland types; along streams, rivers, bogs, ponds, and lakes. Dominated by tall shrub species such as highbush blueberry, winterberry, buttonbush, or speckled alder .	Three non-riparian types documented in NH. All are widespread. Types: • Highbush blueberry-winterberry tall shrub thicket (S4) • Buttonbush basin swamp (S4?) • Speckled alder basin/seepage shrub thicket (S3S4)

FRESH WATER WETLANDS (PALUSTRINE SYSTEM):

OPEN WETLANDS (<25% tree cover)

PEATLANDS

Peatland communities are indicated by peat mosses (Sphagnum species) and deep peat soils (generally > 40 cm); or in the case of some rich fens, they may be dominated by non-Sphagnum mosses ("brown mosses") and sedges. A single peatland complex almost always consists of several bog and fen communities.

Natural Community Group	Characteristics and Landscapes	Examples and Other Comments
BOGS AND FENS	Hydrologically, "bogs" are peatlands whose only source of water is precipitation; if this definition is used, NH has no bogs. However, we use the term "bog" to describe peatland sites that are extremely nutrient poor (pH < 4.0), are little influenced by runoff from the surrounding landscape, and only have plants indicative of these conditions. Fens are sedgey/shrubby peatlands influenced by groundwater seepage and/or water of streams and lakes; they occur in groundwater basins, drainageways, bases of slopes, sloping upland till positions, and riverbanks. Changes in bog or fen community types within a site are usually marked by a shift in vegetation structure (dominant life forms and height).	A few peatland communities are common, such as the medium-height to tall shrub communities, while many are uncommon to very rare. There are four major structural types that may occur in one or more of the bog communities or the poor, medium, or rich fen peatland communities: • Mud-bottoms, open moss lawns, and flarks: moss/liverwort dominated, heath shrubs very sparse. • Dwarf- and medium-shrub bogs and fens: dominated by dwarf or medium height shrubs. • Sedge and shrub-graminoid fens: dominated by combinations of sedges and grasses with shrubs. • Tall shrub thicket fens: dominated in part by tall shrubs (>1.5 m height).
Bogs	Shrubby peatlands of stagnant surface water basins or drainageways; in till uplands, kettleholes, and stagnant pond or lake margins. Bogs are dominated by dwarf shrubs and black spruce (<0.5 m); herbs limited to occasional, sparse, short sedges. pH<4.	Examples: • Wet alpine/subalpine level and sloping bog (S1) • Leatherleaf-sheep laurel/Sphagnum *capillifolium* dwarf heath shrub bog (S1S3)
Poor fens	Influenced more by runoff or slow seepage than are bogs. Typically dominated by dwarf to tall heath shrubs and some herbs, including robust sedge species such as bottle-shaped sedge (*Carex utriculata*). pHs generally 4.0-4.5. Black spruce frequently present, but not always.	Examples: • Sphagnum cuspidatum/large cranberry moss lawn (S3) • Bog rosemary-sweet gale/bottle-shaped sedge/*Sphagnum fallax* fen (S3)

Natural Community Group	Characteristics and Landscapes	Examples and Other Comments
Medium fens	Vegetation typically includes robust sedge species. Medium fens often indicated by speckled alder (*Alnus incana*), sweet gale (*Myrica gale*), and diverse forb species. Black spruce generally not present. pH=4.5-6.5.	Examples: • Sweet gale-meadowsweet/tussock sedge streamside/pond-border fen (S4) • Hairy-fruited sedge/sweet gale-large cranberry sedge fen (S3)
Rich fens	Peat mosses uncommon or absent. Vegetation dominated by short to robust sedges. pH>6.5.	Example: • Calcareous sedge/moss fen (S1) • Circumneutral-calcareous flark (S1)

TIDAL AND SUBTIDAL ZONES (ESTUARINE SYSTEM)

Includes tidal and subtidal habitats affected by salt-water inundation. Degree of fresh water influence, regularity of inundation, and substrate type are important factors in determining community patterns.

Natural Community Group	Characteristics and Landscapes	Examples and Other Comments
Intertidal marshes	Habitat inundated by salt and/or brackish tide waters on a daily or irregular frequency. Peat and peaty-mineral soil marshes with robust vegetation.	Six types documented in NH. All are uncommon or rare, given their restricted distribution. Examples: • Low and high salt marsh (S3) • Low and high brackish tidal riverbank marsh (S1S2)
Intertidal flats and shores	Exposed mudflats and rocky shores with sparse vegetation, generally at lower elevations than salt and brackish marshes.	Three types documented in NH. All are uncommon or rare. Examples: • Coastal shoreline strand/swale (S2) • Intertidal rocky shore (S3)
Subtidal communities	Tidal habitats not exposed at low tide (subtidal) but clearly influenced by tides.	Four types documented in NH. All are uncommon or rare. Examples: • Tidal creek bottom (S3) • Eelgrass bed (S1)

LAKES AND PONDS (LACUSTRINE SYSTEM)

Shallow- to deep-water aquatic environments of lake and pond settings, without rooted vegetation.

Natural Community Group	Characteristics and Landscapes	Examples and Other Comments
LAKES AND PONDS	Shallow and deep-water habitats of lakes and ponds. Turnover and temperature stratification are important factors. Monomictic ponds have one turnover period, are generally not stratified, and are shallow. Dimictic lakes have two turnover periods per year, are often stratified, and are deep. Nutrient status is also important. NH has a high percentage of lakes compared to some other New England states, such as VT.	In need of further classification work. Examples: • Alpine/subalpine pond (tarn) • Kettle hole pond • Low and medium nutrient monomictic and dimictic ponds • Moderate-high alkalinity pond • Oxbow pond

RIVERS AND STREAMS (RIVERINE SYSTEM)

Shallow- to deep-water aquatic environments of river and stream settings, without rooted vegetation.

Natural Community Group	Characteristics and Landscapes	Examples and Other Comments
RIVERS AND STREAMS	Aquatic habitats of moving water environments; influenced by the slope of the channel and the nature of the surrounding and underlying substrate. Found in valleys and headwaters of drainages of all sizes.	In need of further classification work. Examples: • High-gradient and low-gradient streams • Major river

CONCLUSIONS

While identification of many natural communities requires only a basic familiarity with plants, recognizing other types may require more in-depth botanical knowledge. If plant identification experience is limited, or in situations that do not require the fine level of detail involved in identifying natural communities, broad, easily recognizable groups can be used to summarize the diversity of vegetation across the landscape. Groups defined based on a combination of tree canopy composition, vegetation structure, and landscape features begin to capture the diversity of natural communities at a coarse scale. By recognizing these broad groups of natural communities and understanding their relative rarity, foresters and other land managers will increasingly be able to recognize areas in the state that have the potential to contain rare plant populations or exemplary natural communities.

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Appendix 1. Explanation of global and state rank codes.

Ranks describe rarity both throughout a species' range (globally, or "G" rank) and within New Hampshire (statewide, or "S" rank). The rarity of sub-species and varieties is indicated with a taxon ("T") rank. For example, a G5T1 rank shows that the species is globally secure (G5) but the sub-species is critically imperiled (T1).

Code	*Examples*		*Description*
1	G1	S1	Critically imperiled because extreme rarity (generally one to five occurrences) or some factor of its biology makes it particularly vulnerable to extinction.
2	G2	S2	Imperiled because rarity (generally six to 20 occurrences) or other factors demonstrably make it very vulnerable to extinction.
3	G3	S3	Either very rare and local throughout its range (generally 21 to 100 occurrences), or found locally (even abundantly at some of its locations) in a restricted range, or vulnerable to extinction because of other factors.
4	G4	S4	Widespread and apparently secure, although the species may be quite rare in parts of its range, especially at the periphery.
5	G5	S5	Demonstrably widespread and secure, although the species may be quite rare in parts of its range, particularly at the periphery.
U	GU	SU	Status uncertain, but possibly in peril. More information needed.
H	GH	SH	Known only from historical records, but may be rediscovered. A G5 SH species is widespread throughout its range (G5), but considered historical in New Hampshire (SH).
X	GX	SX	Believed to be extinct. May be rediscovered, but evidence indicates that this is less likely than for historical species. A G5 SX species is widespread throughout its range (G5), but extirpated from New Hampshire (SX).

Modifiers are used as follows.

Code	*Examples*		*Description*
Q	G5Q	GHQ	Questions or problems may exist with the species' or sub-species' taxonomy, so more information is needed.
?	G3?	3?	The rank is uncertain due to insufficient information at the state or global level, so more inventories are needed. When no rank has been proposed the global rank may be "G?" or "G5T?"

When ranks are somewhat uncertain or the species' status appears to fall between two ranks, the ranks may be combined. For example:

G4G5	The species may be globally secure (G5), but appears to be at some risk (G4).
G5T2T3	The species is globally secure (G5), but the sub-species is somewhat imperiled (T2T3).
G4?Q	The species appears to be relatively secure (G4), but more information is needed to confirm this (?). Further, there are questions or problems with the species' taxonomy (Q).
G3G4Q S1S2	The species is globally uncommon (G3G4), and there are questions about its taxonomy (Q). In New Hampshire, the species is very imperiled (S1S2).